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Does special education predict students' math and language skills?

Ratib Lekhal PhD

Department of Communication and Culture, Norwegian business school, Oslo, Norway

Corresponding author is Ratib Lekhal, Department of Communication and Culture, Norwegian business school, postal address: NO-0442 Oslo, C4-019, Nydalsveien 37, 0484 Oslo, Norway, email: Ratib.Lekhal@bi.no, phone: +47 46410587

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Abstract

A large number of children are today receiving special education in Norway. The high cost to society and possible long-term consequences for the students makes it important to understand the interrelationship of the causes and effects related to receiving special education services. Unfortunately, at present there are only few rigorous studies of the effects of receiving special education services. This study examined the interrelationship between receiving special education services and students' math and language skills in upper secondary school in Norway. Data from 2,756 students in the large population-based special education study (SPEED) was used that included information from questionnaires on students' development, learning environment and family background. Results showed that students receiving special education services had slightly lower scores on their language test but similar scores on their math test compared to the group of students not receiving special education services, when conservative methodological approaches were used to control for possible covariate bias.

Keywords: Special education, effect, learning outcomes

Introduction

The number of students receiving special education services in Norway has risen rapidly for the last 5 to 10 years: 5.4 per cent in 2004 and 8.3 per cent in 2013 (Statistics Norway 2013). Today, about 18 per cent of available education resources are allocated to special education, with a yearly cost of approximately 10 billion NOK (US $1.3 billion) (Norwegian Directorate for Education and Training 2016). The main objective of special education is to provide an alternative for those students who do not benefit from ordinary education and thus give them an equal opportunity to learn in the same way as their peers (Norwegian Directorate for Education and Training 2015). Failure in primary and secondary school may have consequences for academic success later in life as well as for long-term social and behavioural adjustment and vocational outcomes (Jimerson, Egeland, & Teo 1999). We should take caution against valuing special education only in terms of its effects on academic progress. Still academic progress is important, also for students with special education.

There are only a handful of rigorous quantitative studies available on the effects of receiving special education services and students' academic progress (Dempsey, Valentine, and Colyvas 2015). This study adds to current literature by examining how special education in Norway is related to math and language tests in upper secondary school in a large-scale longitudinal population study. We estimate associations using conservative modelling approaches in order to handle potential selection effects.

Challenges in studying the effects of special education

It is difficult to examine the effect of special education, because it is not randomly determined which students receive special education and which do not. The gold standard when looking for causal relationships is RCT studies (randomized controlled studies). However, this type of design is problematic, because it would be unethical to deprive students with special needs the right to special education.

Therefore, most studies in the field use non-experimental observation designs. A common way to analyse these data is to examine the relations between different phenomena of interest. One serious concern with such studies is that omitted variables will bias the estimated associations (Heckman 1979; Morgan et al. 2008; Dempsey, Valentine, and Colyvas 2015). For this reason, it is common to include measured background variables as control variables.

However, adjustments in analyses of that kind only take away the biases in the data attributable to the observed variables. There is still a risk that factors that have not been observed may have an impact on the results (Duncan and Gibson-Davis 2006). Hence, even large covariate sets cannot capture all potential sources of selection (Duncan, Magnuson, and Ludwig 2004). In other words, there may be areas that are not measured or observed in the study that might affect the relationship of interest. Consequently, unmeasured school, child or family factors may influence both the students' opportunity to receive special education services and their learning outcomes. Respectively, estimates from studies of that kind should be considered as indicative of associations rather than of causal effects.

More recent education researchers have recommended the use of more conservative statistical approaches to handle possible selection bias (Dempsey, Valentine, and Colyvas 2015; Morgan et al. 2008; Duncan, Magnuson, and Ludwig 2004). Statistical approaches like propensity score matching, fixed-effects models and residualized change models are all well suited for drawing causal inferences from non-experimental observational designs.

Even though special education may have several goals—such as strengthening students' academic progress, social skills, life skills and socio-emotional well-being, this paper focuses solely on students' academic progress. With that in mind, the following section provides a short review of the relevant literature and discusses the study designs and findings,

paying the most attention to the few largest and most comprehensive studies that have examined the relationship between special education and student academic progress.

Special education placement and student academic progress

Despite the methodological difficulties, researchers have attempted to determine the effectiveness of special education. Several studies have documented negative associations between special education placement and student learning. Associations appear the strongest when researchers simply contrast the learning of students who received special education services to those who did not. For example, a US-based study found that over 65 per cent of eighth graders with disabilities, in contrast to approximately 25 per cent without disabilities, scored below the basic level on the 2005 National Assessment of Educational Progress reading and math test (U.S. Department of Education, National Center for Education Statistics 2007). Similarly, a Norwegian study by Nordahl and Sunnevåg (2008) found large differences in grades between children with and without special education placement (Cohen's d = 1.4).

Beyond the simple contrasting of students who received and did not receive special education services, studies have continued to find that special education predicts negative learning outcomes. For instance, a study in the UK found a negative association between special education and children's test scores, even when controlling for background characteristics (Keslair and McNally 2009). Likewise, a Nordic study found that students who received special education services had lower grades and test results, even when earlier achievement was accounted for (Giota, Lundborg, and Emanuelsson 2009).

All of the studies mentioned so far share the common weakness discussed above: Omitted variables may have biased the estimated associations. More recently, however, a few studies paid greater attention to potential selection effects. The results from two US-based studies confirmed that students receiving special education services showed significantly lower reading and mathematical skills than closely matched peers who did not

receive special education services (Morgan et al. 2008; Sullivan and Field 2013). Likewise, an Australian study (Dempsey, Valentine, and Colyvas 2015) found negative associations between special education placement and student learning. All three studies used propensity scores when examining the effects of being placed in special education on student learning. Finally, a study in the UK (Keslair, Maurin, and McNally 2012) analysed the casual effects of special education placement using an Instrumental Variable (IV) strategy to remove the selection effects and yield a causal estimate on test scores in math, English and sciences for students aged 11. Overall, they found that special education placement had no effect on test scores. All of the four studies paying greater attention to potential selection effects tended to reveal smaller or no effects of special education services as compared to studies paying less attention to potential selection effects.

Taken as a whole, however, most studies that have attempted to determine the effect of special education services are disappointing, because they did not adequately address the methodological issues regarding the selection process. In addition, none of the four studies that used the most conservative ways to deal with selection effects were conducted in the Nordic countries. Thus, we still have only limited knowledge of how special education placement affects student learning (Morgan et al. 2008; Dempsey, Valentine, and Colyvas 2015), and the evidence is particularly sparse from the Nordic countries (Giota, Lundborg, and Emanuelsson 2009).

Decisions for special education: the Norwegian model

In Norway there is a comprehensive set of rules for how to determine whether students should receive special education services (Norwegian Directorate for Education and Training 2014) and is typically carried out through three steps.

In a *first* step, when a student does not benefit sufficiently from ordinary education, the school are responsible for referring that student to the educational and psychological

counselling service (PPT). Hence, it is up to each school and the individual teacher to decide what satisfactory benefit from ordinary education is, and may cause variation between schools. In addition, the school needs parental consent for a student to be referred to the PPT (Education Act, 1998). In the *second* step, the PPT completes an assessment indicating whether the student needs special education services or not (Education Act, 1998, section 5-3). In the *final* step, the school leader checks whether the assessment by the PPT provides a reasonable basis for making the decision. The school leader can also ask for further assessments or ignore the assessment.

A weakness in the process chain is that there are discretionary decisions in all phases. Nilsen and Herlofsen (2012) found varying consistencies between the national regulations and local practice in different phases in content and in their organization in special education. This creates the risk of fragmentary work instead of cohesive tutoring and training for students in special education (Nilsen and Herlofsen 2012). Thus, students in special education may experience large variation in the educational quality.

This study

This study used a large-scale longitudinal population study to examine how special education is related to math and language tests among Norwegian students. The study investigated whether having special education services in Grades 5, 6, 8 or 9 was related to results on math and language tests one year later.

The results were examined using conservative and recommended methodological approaches in order to control for possible covariate bias in our data.

Method

Participants

The study used data from the large special education project SPEED, a national research project funded by the Norwegian Research Council. All schools and students in Grades 55, 6, 8 and 9 in two municipalities were invited to participate at T1 (in 2013). The rationale to choose two municipalities was based on the goal of including in this study approximately 200 students receiving special education services. To do this, we calculated that we would need to gather data from around 3,000 students. Municipalities near the two "university colleges" running this study were selected so as to save on travel costs and to be able to use students in Master's degree programmes to gather part of the data. We contacted the school management in the municipalities by both e-mail and face to face contact. A formal agreement on participation was signed, and the school management instructed the schools to participate. Information meetings were held for principals and the schools' parent representatives in 2012 and 2013.

The two municipalities are in different parts of the country and have different cultures and industry. The schools include small, medium and large schools as well as schools located in smaller towns, medium-sized towns and in larger cites. Moreover, analyses of prevalent differences between the two municipalities and the national sample regarding gender, parents' background and the number of students receiving special education services revealed no noticeable differences (Topphol, Haug, and Nordahl 2017). Even if we cannot be sure that the sample are nationally representative, we believe the results would be valid also in a larger population.

There was a total of 29 schools in the two municipalities. Students were invited to participate per information letter with an accompanying parent consent form. Consent declaration included the student's participation and consent for the student's teacher to answer questions about the student. The project was approved by the Norwegian Centre for Research Data (NSD).

Of the students invited from the 29 schools, 2,756 (92.8 per cent response rate) agreed to participate at T1 in 2013. Information from questionnaires on student development, learning environment and family background was collected from the students themselves, their teachers and their parents. In addition, all students took a math and a language test. The same respondents repeated all measures and tests one year later at T2 in 2014.

Measures

Special education status

At T1 the main teacher of each student was asked if the student received special education services. The response options were: ’Yes’, ‘No’ or ‘Don’t Know’. A dummy variable was constructed at T1 in which ‘Yes’ was coded 1 and ‘No’ was coded as 0. We coded it as missing data when the main teacher responded that he or she did not know whether the student received special education services.

Math test

Each student completed a multiple-choice test of math skills at both T1 and T2 (same test at T1 and T2). The test included 40 questions for students in Grades 5 to 7 and 52 questions for students in Grades 8 to 10. The first 40 questions were common to all students, and students in Grades 8 and 9 had 12 extra. Each question had seven response options, including ‘Don’t know’. One of the six other response options were correct; the five others were included as distractors. The percentage of correct answers was calculated for each student at T1 and T2.

We considered using an already developed math test. However, a weakness of some of these tests (at least the Norwegian tests) is that they do not include the breadth of themes that we preferred for this study. A goal of the SPEED study was to test student’s math skills on a range of different tasks, so that all the main areas of the national curriculum were represented

(Opsvik and Skorpen 2017). Furthermore, an aim was also to measure the large variation between students. Thus, the test had to make sure that it mapped the math skills of both academically weak and academically strong students. The tasks in the test were therefore gradually more difficult and harder with increasing task numbers. That is, the first tasks on the test were designed so that 100 per cent of the test-takers chose the correct answer. Discrimination analyses (point biserial correlation coefficient) showed that the test was well suited to distinguish between academically weak and for academically strong students (Opsvik and Skorpen 2017). Further, the internal consistency of the test was measured by Cronbach's alpha, and the results showed very satisfactory values for alpha: 0.886 for Grade 5 (T1), 0.897 for Grade 7 (T2), 0.898 for Grade 8 (T1) and 0.921 for Grade 10(T2) (Opsvik and Skorpen 2017).

Language test

All students were tested at T1 and T2 on their Norwegian skills by completing a recognised Norwegian spelling and writing test developed for students in primary and secondary school (Carlsten 2002). The reading subtest measured students' reading speed and their comprehension of the text. The text is adapted to the student's age level. Each student has 10 minutes to read the text and fill in (multiple choice) missing words in the text. An example from the test is: *Hard as … (stone–wool–tree)*. The total of correct and wrong answers was calculated for each student. In addition, students' writing skills were measured by a subtest on spelling. The teacher read a text, sentence by sentence, and the students wrote down each sentence. The number of right and wrong answers was calculated. Finally, based on the two subtests, the percentage of correct answers was calculated for the students at T1 and at T2.

Confounding variables

The rationale for including the selected confounding variables builds on both theory and prior empirical research that identified background characteristics that increase a child's risk of receiving special education services (for a review, see, for example, Morgan et al. [2008] and McCoy, Banks, and Shevlin [2012]). In addition, to maximally reduce the potential for selection bias, many covariates should be included to predict the propensity score (e.g. Shadish et al. 2002). We therefore also included several other supplementary covariates that can function as predictors of receiving special education services.

Information on confounding variables was collected by questionnaires filled in by students, their teachers and their parents at T1. The selection and adaptation were based on both prior theory and already existing scales (see Table 1). An expert group consisting of education researchers and practitioners were responsible for the selection and adaptation of the scales (for a more comprehensive account of the methods, see Topphol, Haug, and Nordahl [2017]). Table 1 shows more information on all covariates, the informant group, internal consistency (Cronbach's α) and the sources on which the scales are based.

Even though this study and the sample have several strengths, there are also limitations that we need to acknowledge. For instance, the study may underrepresent socio-economically disadvantaged parents; there is no information on the duration of the special education services received or the quality of provision; and there are issues concerning the sample selection. These are all highly important issues that we return to in the Discussion section.

Analyses

In this study, our interest is that selection processes rather than special education status per se may affect student achievement. In line with recent pleas for more conservative statistical approaches for handling possible selection bias in special educational studies using

observational data (Morgan et al. 2008) we used three different methodological approaches to examine the research questions.

The *first* approach included a residualized change model by controlling for students' baseline math and language test scores. This approach answers the question of whether it is a student effect that accounts for the association between special education and test scores. A causal role for special education would be more plausible, if over time, students who receive special education services experienced a different change on the math and language test than students who do not receive special education services. The rigidity of this model would provide strong support for a special education effect, since it would almost eliminate the possibility that associations are caused by the student rather than by special education (NICHD and Duncan 2003).

The *second* approach was to include a fixed effect model. Because students at the same school are exposed to the same school environment, their families most likely come from roughly the same socio-economic levels of society, and they have more comparable probability of being referred to special education, they are probably more similar to each other than to students at other schools. For instance, a recent study found that children attending highly disadvantaged school contexts are far more likely to be identified with behavioural problems and less likely to be identified with learning disabilities than children with similar characteristics attending other schools (McCoy, Banks, and Shevlin 2012). To control for the unobservable differences between schools, we conducted all analyses by studying the relationship within each school (within group variation) rather than between different schools (between group variation). Our estimates thus reflected the average estimate for each school.

The *third* approach was to use propensity score matching (Rosenbaum and Rubin 1984). Propensity score matching is well suited when making causal inferences from observational data in which a subgroup of the observations participated in or experienced

some kind of ‘treatment’ (e.g. special education) without random assignment (Hill and Reiter 2006). This method estimates the probability of receiving special education services for each student. This is done using logistic regression, with special education as the dependent variable and the covariates (described in Table 1) as predictors. The results from this analysis give each student a probability from 0-100 per cent of receiving special education services. When the final analysis was carried out, the probability index was used as a covariate to adjust the results. The results are thus reported on the assumption that probability remained constant for all students.

In this way estimated the effect of special education in three steps, using increasingly conservative methodological approaches. The result was a higher probability of finding causal relationships.

Participants had missing data because of attrition or not answering parts of the questionnaires or because other participants (i.e. main teacher or the respective parents) did not answered questions about the student. The percentage of missing data from the students and the teacher was less than 14 per cent across all items at T1. However, for the math and language test at T2 the amount of missing data was 24.8 per cent and 26.5 per cent. Missing data in relation to data gathered from the parents was more considerable, however, and varied around 44 per cent (for an overview of all variables, see Table 1). To deal with missing data, we followed best practice recommendations for handling moderate to large amounts of missing data, using multiple imputations (MI) (Schafer and Graham 2002). MI replaces each missing data point with a set of (m> 1) plausible values and then generates complete datasets (m). In this study, we used MI to construct 10 complete datasets based on all covariates in Table 1. This provided a full dataset for 2756 students that combined observed and imputed values. As a robustness check of our results, we also repeated all analyses using listwise

deletion and MI with 20 and 25 complete datasets. The procedures produced similar results.

Results

Descriptive analyses

Table 1 presents descriptive statistics. The percentage of students with special education status was 8.5 per cent. There were more boys than girls (11.4 per cent boys and 5.0 per cent girls). Most factors had high or adequate internal consistency.

[Table 1 about here]

Special education and scores on math and language tests

Multiple regression analyses were conducted to examine how special education is related to scores on a math and language test. Analyses where done in four steps, and moved beyond the measured covariate approach used in most prior studies.

The first column in Table 2 shows the results of a simple comparison (unadjusted model) of students with and without special education. The association between special education and both math and language test scores was significant, with a large estimated coefficient in the unadjusted model (difference of approximately 1.5 standard deviations).

[Table 2 about here]

However, the picture changed when more conservative methodological approaches were applied. Adjusted model 1 (residualized change model) resulted in a large decrease in the estimated coefficients (from 1.5 to approximately 0.4 standard deviations), whereas adjusted model 2 (adding fixed effects model) did not change the estimated effect

size notably. In the adjusted model 3, where three approaches (residualized change model, fixed effects model and propensity score adjustment) were used, the results showed a further decrease in the estimated coefficients for special education. In fact, it reduced the negative effect of special education to only 22per cent of a standard deviation on the language test score and to a non-significant association with the math test score (all $p > .05$). Worth mentioning is that an effect size of -0.22 would not have been characterised as having a major practical importance even if the relationship was in the opposite direction.

Potential moderators

Potential moderators were tested by entering interaction terms into separate multiple regression analyses. Interactions between the type of main problem the student had (behaviour problems, math or language problems or general learning disabilities) and special education status were examined. The results showed that none of the four tested interaction effects were significant (all $p > .05$). However, it is worth noting that these analyses may have been affected by low sample size when we divided our sample into several subgroups.

Discussion

This study is among the first Nordic studies that examine the impact of special education on student learning using conservative methodological approaches to control for possible covariate bias. The major finding from this study is that children receiving special education services had significantly lower scores on a language test but similar scores on a math test as compared to a group of children not receiving special education services when conservative methodological approaches were used to control for possible covariate bias. However, the size of the negative association was relatively small.

Our results are in line with the few studies (Morgan et al. 2008; Sullivan and Field 2013; Dempsey, Valentine, and Colyvas 2015; Keslair, Maurin, and McNally 2012) in

the field that paid greater attention to potential selection effects. Even if we should not assess the effectiveness of special education provision based on student academic progress alone, academic progress is important in students' lives. A brief discussion of why special education does not seem to give students better learning outcomes compared to 'similar' students in ordinary education is therefore warranted.

For instance, it might be that the quality of the teaching is lower when the students receive special education services. Of all special education delivered in Norway, 30per cent is carried out by unqualified teachers, and this could result in lower quality education for these students (Norwegian Directorate for Education and Training 2016). Moreover, there is considerable variation in how special education teaching is understood and practised (Giota, Lundberg, and Emanuelsson 2009; Nevøy and Ohna 2014). Groups are combined across students' needs, across classes and across disciplines, which causes complexity for both the teacher and students. Nilsen (2016) found that there is varying consistency in the content and organisation of special education in Norway in addition to prevailing confusion about the responsibility distribution in efforts to plan for students who receive special education services. There is disagreement concerning who should prepare the individual education plan and whether the person responsible for it should work alone or should have opportunities for joint coordination with colleagues. This creates the risk of fragmentary work instead of cohesive tutoring and training for students in special education (Nilsen and Herlofsen 2012). Nilsen (2016) further points to the fact that there is little coherence between what is happening in special education and what is happening in ordinary education, and that this may affect the student negatively. The students have their own hours, their own plans and their own teachers, which might be only marginally associated with what goes on in the students' ordinary education. This is problematic, because most students only have limited hours of special education services during the week. Consequently, students with

special education services may experience large variability in their educational quality and lack of overall continuity in their education (Nilsen 2016).

Furthermore, special education may also be characterised by low expectations for students and by teaching on a relatively low cognitive level (Kjellin and Wennerstrøm 2006).

Should it be the case that teachers, parents and students themselves have lower expectations of students receiving special education services, this could potentially cause poorer learning outcomes. For instance, low expectation on the part of the teachers may affect how the schooling is planned and conducted. A recent report from English School Inspectorates (OfSTED 2004), found that only 40 per cent of the schools had high expectations for students with special needs in subjects like reading and writing. Several studies on ordinary education have highlighted the importance of students' expectations in relation to their learning (Rubie-Davies and Rosenthal 2016), suggesting that when students' expectations are high, their learning will increase accordingly. Furthermore, low teachers' expectations will be associated with the level of the academic content. A recent Norwegian report stressed that the academic level for students who received special education services in Norway was much lower than for their peers (Norwegian Ombudsman for Children 2017).

Similarly, both the student and the student's parents may change their expectations of academic progress when the child receives special education services. A recent study by McCoy, Maître, Watson, and Banks (2016) found that parental expectations have a significant effect on children's academic outcomes and partly explain the effects of disability status on academic development.

Limitations

This study has several strengths, including being population based and using conservative methodological approaches to control for possible covariate bias. However, the study also has limitations. First, with the relatively low recruitment of parents (55 per cent), selection bias is probable. In particular, disadvantaged parents may have been underrepresented in the study. However, best practice recommendations for handling longitudinal studies with participants with some missing values were followed. In addition, in Norway the impact of bias of that kind may be reduced by the existence of high-quality social services provided by the government, which minimises variation among families.

Second, this study was only able to measure the effect of special education for a period of one year. The study did not have any information about what the possible long-term effects would have been for these students. Furthermore, this study did not have any information as to how long the students have received special education services. It may be that students who receive special education services over a longer period of time develop differently than students who received this type of education for a shorter period, such as one year. The need for replicating studies and studies that follow students over longer time periods will be crucial in the future to gain an even better and more comprehensive picture of the situation of students with special needs.

Third, the quality of the special education was not measured directly in this study. The study would be stronger had it been able to examine quality as a moderator of the impact of special education on student learning. However, the fact that we examined the effect within each school instead of between the different schools makes it more plausible that the quality of the special education is relatively homogeneous and provides the possibility to examine the general relationship, even though no information on the quality for each student was available. Including the quality of the special education in such studies should be seen as a logical next step in the field. Further, we report mostly main effects in this study. It is

conceivable that other, stronger or weaker relations would occur if we had studied subsamples. Future studies should focus more on different groups of children receiving special education services.

Fourth, even though a large variation of different schools was included in our sample and analyses of prevalent differences between the two municipalities and the national sample found no noticeable differences, we cannot be certain that our results can be generalised to the larger population. Thus, replication in other samples is needed.

Finally, even though this study applied a variety of statistical approaches with the dual goals of taking more conservative steps towards controlling for potential selection bias, it is not possible to be completely sure that we eliminated individual heterogeneity and reverse causality problems. Estimates should therefore be replicated with different samples and with different methods.

Conclusion

Despite these limitations, the study provides important new insights concerning the impact of special education on student learning. The results reveal that receiving special education services does not necessarily lead to more learning—at least not for this particular sample and for the chosen outcome measure used in this study. Importantly, the results of this study do not argue that special education is not needed or would not benefit some or in certain more specific domains. Even though student academic progress is important for all students, it is important that we see the effectiveness of special education provision in a broader view than only in relation to student academic progress. We have to keep the field open and consider that the effectiveness of special education provision is not defined by student academic progress alone. Among many other things, it is possible that special education produces benefits and positive development in other important areas, such as school attendance,

attitudes to school, and student affective outcomes. It may prevent helplessness, teach impulse control, and so on. The special educator's daily goals may be more clinical and consist of retaining the students in class; helping them keep up with the curriculum, complete the set requirements and contain their motivation and emotions; and providing individual help to ensure mastery of basic strategies and research methods. This is work that is outside the reach of the normal classroom teacher. Lessening negative trajectories in any way will have a massive impact on children's lives. Thus, our findings may indicate how special education cannot suddenly reverse the impacts of negative circumstances, and we probably should not expect it to do so. However, the study does show that in general, special education does not raise academic skills despite the additional resources provided to students. The children receiving special education services are those within the school system that are the most vulnerable and in need of help. The need for studies that evaluate the quality of the special education offered might be a logical next step in the field. Quality data on the education that is delivered, the organisation of the child's education and by whom the teaching is conducted by (e.g. qualified, unqualified) are critical factors in order to understand more about special education.

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Table 2. Prediction of students' scores on math and language tests based on special education status.

Predictor	**Unadjusted model** STDY		**Adjusted model 1** STDY		**Adjusted model 2** STDY		**Adjusted model 3** STDY	
	Math test	Language test	Math test	Language test	Math test	Language test	Math test	Language test
No special education (reference group)								
Special education	***-1.42******	***-1.60******	**-.37*****	**-.42*****	**-37*****	**-.44*****	-.01	**-.22****

Note STDY= Estimate with standardized Y variable (change in SD on math and language tests, no special education to special education). Adjusted models: control for selection bias by using increasingly conservative methodological approaches. Adjusted model 1: residualized change model. Adjusted model 2: residualized change model and fixed effects model. Adjusted model 3: residualized change model, fixed effects model and propensity score adjustment.

*$p < .05$ **$p < .01$ ***$p < .001$

Table 1. Summary of means, range, standard deviations, and % of complete data coverage (*N* = 2,756)

Variable	M(SD)%	Range	% covered	Items/alpha	Source
Special education status	8.5%		91.8		
Math test T1 *Z*-scores	0 (1)	-3.73-2.25	89.8		
Math test T2 *Z*-scores	0 (1)	-4.11-1.95	75.2		
Language test T1 *Z*-scores	0 (1)	-6.41-2.40	89.7		
Language test T2 *Z*-scores	0 (1)	-6.90-2.83	73.5		
Cofounding variables					
Student report					
Boys	47.3%		94.1		
Relation to the teacher	45.8 (7.6)	14-56	95.0	14/.88	Eccles and Midgley (1989); Eccles et.al., (1993); Moos and Trickett (1974); Ogden (1995); Nordahl and Sørlie (1998); Nordahl (2000, 2005)
Social environment in the class	31.9 (5.0)	10-40	94.6	10/.81	
Culture for learning in the class	16.1 (2.7)	5-20	94.6	5/.75	
Children's well-being in school	23.7 (3.1)	7-28	95.1	7/.71	Rutter (1979); Rutter, Maughan, Mortimore, and Puston (1979); Ogden (1985, 1995)
Externalising behaviour	37.0 (3.2)	8-64	94.7	8/.70	Sørlie and Nordahl (1998)
Internalising behaviour	13.4 (2.0)	3-15	94.9	3/.61	
Learning-promoting behaviour in the class	53.4 (7.5)	13-65	95.2	13/.84	
Experience of math education	19.9 (3.8)	5-25	94.6	5/.79	Haug (2012)
Experience of language education	25.2 (5.2)	7-35	94.7	7/.77	
Help with homework	7.4 (2.4)	2-10	94.4	2/.85	
Language teachers' skills and approach	18.2 (3.8)	5-25	94.4	5/.74	
Time during class for individual work	7.7 (1.5)	2-10	94.5	2/.69	
Student use of information and communication technologies	13.6 (4.6)	7-35	94.7	7/.81	Hatlevik, Egeberg, Gudmundsdottir, Loftsgarden, and Loi, (2013)

Teachers' report on student's					
Self-control	28.3 (6.5)	9-36	87.2	9/.95	Gresham and Elliott (1990, 2008)' Ogden (1995)
Empathy	10.6 (2.9)	4-16	86.8	4/.86	
Assertiveness	22.7 (5.4)	8-32	87.9	8/.91	
Adaptation to school norms	28.3 (6.1)	9-36	89.6	9/.95	
Motivation and work effort	11.4 (2.7)	3-12	88.0	3/ .95	Skaalvik (1993)
Parents' report					
Mother's education					
Lower secondary school	2.3%		55.9%		
Upper secondary school	16%				
Higher education 1-3 years	15.5%				
Higher education over 3 years	22.1%				
Father's education					
Lower secondary school	2.4%		51.8%		
Upper secondary school	17.2%				
Higher education 1-3 years	14.6%				
Higher education over 3 years	17.5%				
Minority background					
Norwegian background	83.8%		83.8%		
Non-Western background	4.1%				
Western background	1.2%				
Attitude towards and support for education	15.2 (1.3)	4-16	56.3	4/.73	Nordahl and Sørlie (1998); Epstein (2009)
Parents' involvement in homework	10.2 (1.6)	3-12	56.3	3/.75	
Contact with the school	23.6 (4.2)	8-32	56.2	8/.86	

Dialogue and involvement in child's education	21.8 (4.4)	9-36	56.4	9/.80	
Influence and collaboration with the school	15.2 (2.4)	5-20	55.7	5/.68	
Relation to other parents in the class	17.3 (4.0)	7-28	56.2	7/.88	